```
L=18;
H=10;
Uinf=1;
La=7.5;
B=1;
Re=24;
Patm=1;
nl=20;
nh=10;
x=linspace(0,L,nl);
y=linspace(-H/2,H/2,nh);
t=linspace(0,5,501);
dx=x(2)-x(1);
dy=y(2)-y(1);
dt=t(2)-t(1);
u=zeros(nl,nh,501);
v=zeros(nl,nh,501);
p=zeros(nl,nh,501);
u(:,:,1)=Uinf;
v(:,:,1)=0;
p(:,:,1)=Patm;
ibox=[];
jbox=[];
for i=1:nl
    if x(i)>=La-B/2 && x(i)<=La+B/2
        ibox=[ibox i];
    end
end
for j=1:nh
    if y(j)>=-B/2 && y(j)<=B/2
        jbox=[jbox j];
    end
end
u(ibox,jbox)=0;
v(ibox,jbox)=0;
for k=1:500
    A1=zeros(nl*nh,nl*nh);
    A2=zeros(nl*nh,nl*nh);
    C1=zeros(nl*nh,1);
    C2=zeros(nl*nh,1);
    for i=2:nl-1
        for j=2:nh-1
            A1(nh*(i-1)+j,nh*(i-1)+j)=dx*dy/dt+0.25*(u(i+1,j,k)-u(i-
1,j,k))*dy+0.25*(v(i,j,k)+v(i+1,j,k)-v(i,j-1,k)-v(i+1,j-
1,k))*dx+2*(dy/dx+dx/dy)/Re;
            A1(nh*(i-1)+j,nh*i+j)=0.25*(u(i,j,k)+u(i+1,j,k))*dy-dy/(Re*dx);
            A1(nh*(i-1)+j,nh*(i-2)+j)=-0.25*(u(i-1,j,k)+u(i,j,k))*dy-dy/(Re*dx);
            A1(nh*(i-1)+j,nh*(i-1)+j+1)=0.25*(v(i,j,k)+v(i+1,j,k))*dx-dx/(Re*dy);
            A1(nh*(i-1)+j,nh*(i-1)+j-1)=-0.25*(v(i,j-1,k)+v(i+1,j-1,k))*dx-
dx/(Re*dy);
            C1(nh*(i-1)+j)=dx*dy*u(i,j,k)/dt-dy*(p(i+1,j,k)-p(i,j,k));

            A2(nh*(i-1)+j,nh*(i-1)+j)=dx*dy/dt+0.25*(v(i,j+1,k)-v(i,j-
1,k))*dx+0.25*(u(i,j,k)+u(i,j+1,k)-u(i-1,j,k)-u(i-1,j+1,k))*dy+2*(dy/dx+dx/dy)/Re;
            A2(nh*(i-1)+j,nh*(i-1)+j+1)=0.25*(v(i,j,k)+v(i,j+1,k))*dx-dx/(Re*dy);
            A2(nh*(i-1)+j,nh*(i-1)+j-1)=-0.25*(v(i,j-1,k)+v(i,j,k))*dx-dx/(Re*dy);
            A2(nh*(i-1)+j,nh*i+j)=0.25*(u(i,j,k)+u(i,j+1,k))*dy-dy/(Re*dx);
            A2(nh*(i-1)+j,nh*(i-2)+j)=-0.25*(u(i-1,j,k)+u(i-1,j+1,k))*dy-
dy/(Re*dx);
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        C2(nh*(i-1)+j)=dx*dy*v(i,j,k)/dt-dx*(p(i,j+1,k)-p(i,j,k));
    end
end
for i=ibox
    for j=jbox
        A1(nh*(i-1)+j-1,:)=0;
        A1(nh*(i-1)+j,nh*(i-1)+j)=1;
        C1(nh*(i-1)+j)=0;

        A2(nh*(i-1)+j-1,:)=0;
        A2(nh*(i-1)+j,nh*(i-1)+j)=1;
        C2(nh*(i-1)+j)=0;
    end
end
for j=1:nh
    A1(j,j)=1;
    C1(j)=Uinf;
    A2(j,j)=1;
    C2(j)=0;
    A1(nh*(nl-1)+j,[nh*(nl-2)+j nh*(nl-1)+j])=1;
    C1(nh*(nl-1)+j)=0;
    A2(nh*(nl-1)+j,[nh*(nl-2)+j nh*(nl-1)+j])=1;
    C2(nh*(nl-1)+j)=0;
end
for i=1:nl
    A1(nh*(i-1)+1,:)=0;
    A1(nh*(i-1)+1,nh*(i-1)+1)=1;
    C1(nh*(i-1)+1)=0;
    A1(nh*i,:)=0;
    A1(nh*i,nh*i)=1;
    C1(nh*i)=0;

    A2(nh*(i-1)+1,:)=0;
    A2(nh*(i-1)+1,nh*(i-1)+1)=1;
    C2(nh*(i-1)+1)=0;
    A2(nh*i,:)=0;
    A2(nh*i,nh*i)=1;
    C2(nh*i)=0;
end
U=A1\C1;
V=A2\C2;
ug=zeros(nl,nh);
vg=zeros(nl,nh);
for i=1:nl
    for j=1:nh
        ug(i,j)=U(nh*(i-1)+j);
        vg(i,j)=V(nh*(i-1)+j);
    end
end
A=zeros(nh*nl,nh*nl);
C=zeros(nh*nl);
for i=2:nl-1
    for j=2:nh-1
        A(nh*(i-1)+j,nh*(i-1)+j)=-2*(1/dx^2+1/dy^2);
        A(nh*(i-1)+j,nh*i+j)=1/dx^2;
        A(nh*(i-1)+j,nh*(i-2)+j)=1/dx^2;
        A(nh*(i-1)+j,nh*(i-1)+j+1)=1/dy^2;
        A(nh*(i-1)+j,nh*(i-1)+j-1)=1/dy^2;
```

```
            C(nh*(i-1)+j)=((ug(i+1,j)-ug(i-1,j))/dx+(vg(i,j+1)-vg(i,j-
1))/dy)/(2*dt);
        end
    end
    for j=1:nh
        A(j,j)=1;
        C(j)=0;
        A(nh*(nl-1)+j,nh*(nl-1)+j)=1;
        C(nh*(nl-1)+j)=0;
    end
    for i=1:nl
        A(nh*(i-1)+1,nh*(i-1)+1)=1;
        C(nh*(i-1)+1)=0;
        A(nh*i,nh*i)=1;
        C(nh*i)=1;
    end
    delp=A\C;
    dp=zeros(nl,nh);
    for i=1:nl
        for j=1:nh
            dp(i,j)=delp(nh*(i-1)+j);
        end
    end
    p(:,:,k+1)=p(:,:,k)+dp;
    uc=zeros(nl,nh);
    vc=zeros(nl,nh);
    for i=2:nl-1
        for j=2:nh-1
            uc(i,j)=-(dp(i+1,j)-dp(i-1,j))/(2*dx*dt);
            vc(i,j)=-(dp(i,j+1)-dp(i,j-1))/(2*dy*dt);
        end
    end
    u(:,:,k+1)=ug+uc;
    v(:,:,k+1)=vg+vc;
end

[X,Y]=meshgrid(x,y);
quiver(X,Y,u(:,:,end)',v(:,:,end)');
```